

# Commercial Barriers to Natural Gas Capture, Supply, and Delivery



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In Support of Natural Gas STAR International

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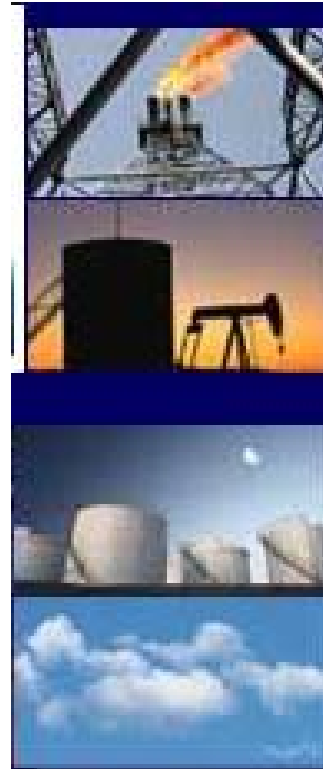




# Outline

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- 🔥 Overview
- 🔥 Stranded and Un-utilized Gas
- 🔥 Bringing Stranded Gas to Market
- 🔥 Addressing Commercial Barriers





# Overview

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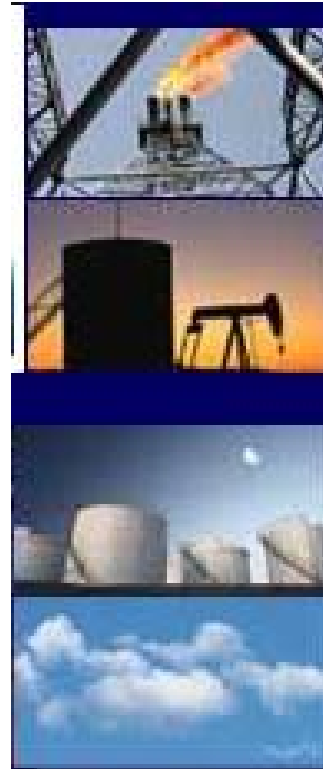
- 💧 Natural gas produced from oil wells is often stranded at the production sites without access to markets
  - 💧 This scenario occurs temporarily or permanently around the globe
  - 💧 Stranded gas is sometimes re-injected, but often flared or vented
- 💧 Stranded gas can be utilized by
  - 💧 Investing in new infrastructure
  - 💧 Investing in new technologies
  - 💧 Revisiting policies and regulations
- 💧 This presentation outlines ways to overcome barriers to utilizing stranded gas



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# Stranded and un-utilized gas is an opportunity

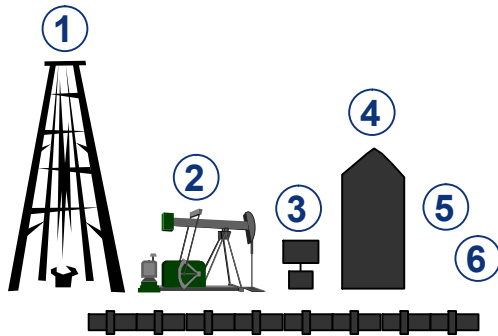
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- 💧 The World Bank Global Gas Flaring Reduction Partnership estimates over 150 billion cubic meters (bcm) of natural gas is flared or vented annually
- 💧 These resources are treated as a byproduct with zero value when in fact they have
  - 💧 sales value
  - 💧 carbon value (>2 billion tonnes CO<sub>2</sub>e in potential carbon credits worldwide)
  - 💧 on-site utility value
  - 💧 displace exploration and production costs



# Reasons for stranded gas

- Gas is stranded because of technical, commercial, and political barriers in-place **at construction time**
  - Lack of infrastructure
  - No identified on-site uses
  - No technology upgrades in place



## Some common stranded gas scenarios:

- 1) No gas pipeline connection during well completion
- 2) No gas pipeline for associated gas
- 3) No engines / turbines / boilers to make use of fuel gas
- 4) No vapor recovery on stock tanks
- 5) No low-emissions technology installed
- 6) No gas processing to meet pipeline specs

- Reexamining gas capture under today's market conditions can increase profits and reduce methane emissions



# Economics of stranded gas capture in today's markets

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- 💧 Recovered gas can be valued different ways depending on the capture project
  - 💧 Sales value
    - 💧 Royalty price
    - 💧 Export / end-use price
  - 💧 Operating value
    - 💧 On-site fuel price
    - 💧 Electricity price
  - 💧 Carbon market value
  - 💧 Environmental value
    - 💧 Value of avoided fees / fines
    - 💧 Value of relationships with regulators and environmental stakeholders
    - 💧 Value of increasing sustainability and environmental stewardship



# Stranded gas examples

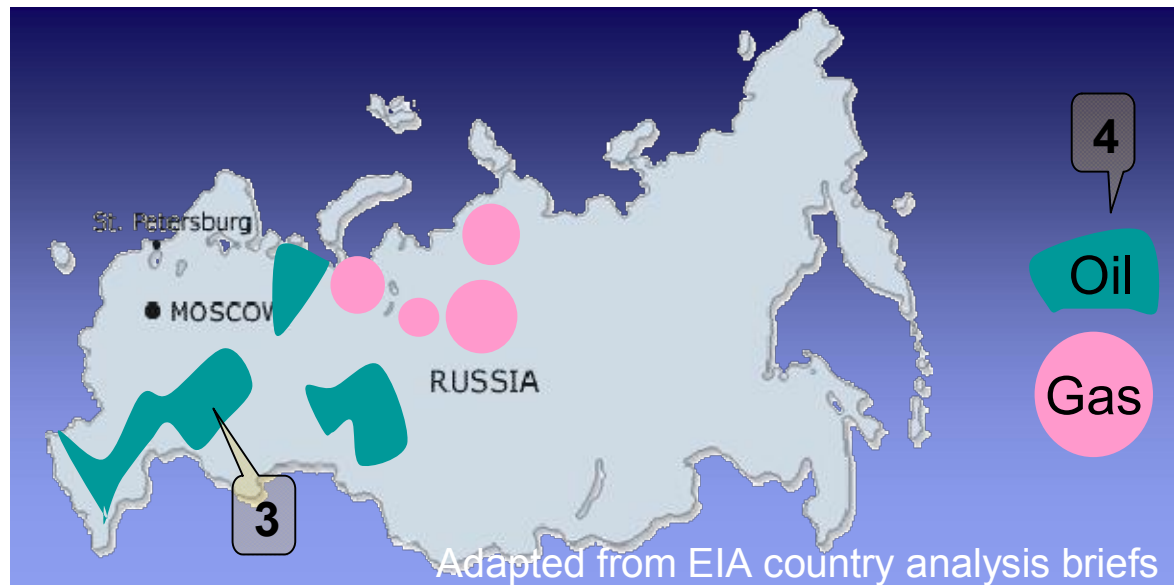
- Example 1: Estimated 1.3 bcm/year methane lost in the United States from well completions where clean-up flow exceeds normal site equipment capacity and gathering lines are not yet connected
- Example 2: Estimated 1.5 bcm/year is lost in the course of long distance natural gas transmission in the United States





# Stranded gas examples

- Example 3: Prior to 2006, TNK-BP was flaring and venting ~2 bcm/year in their Orenberg oil production region
- Example 4: Gas production and transmission from one region of Russia is stranding 50%, or 10 bcm/year of associated gas

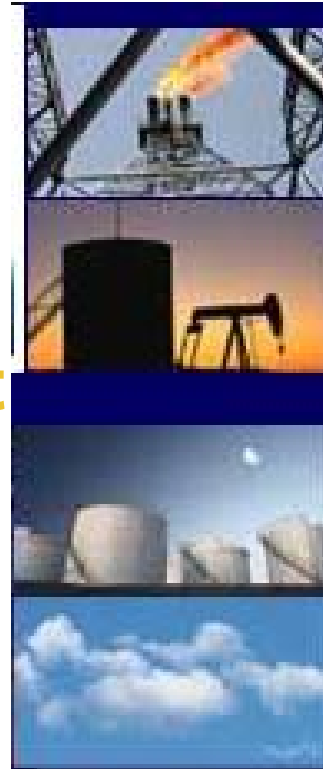




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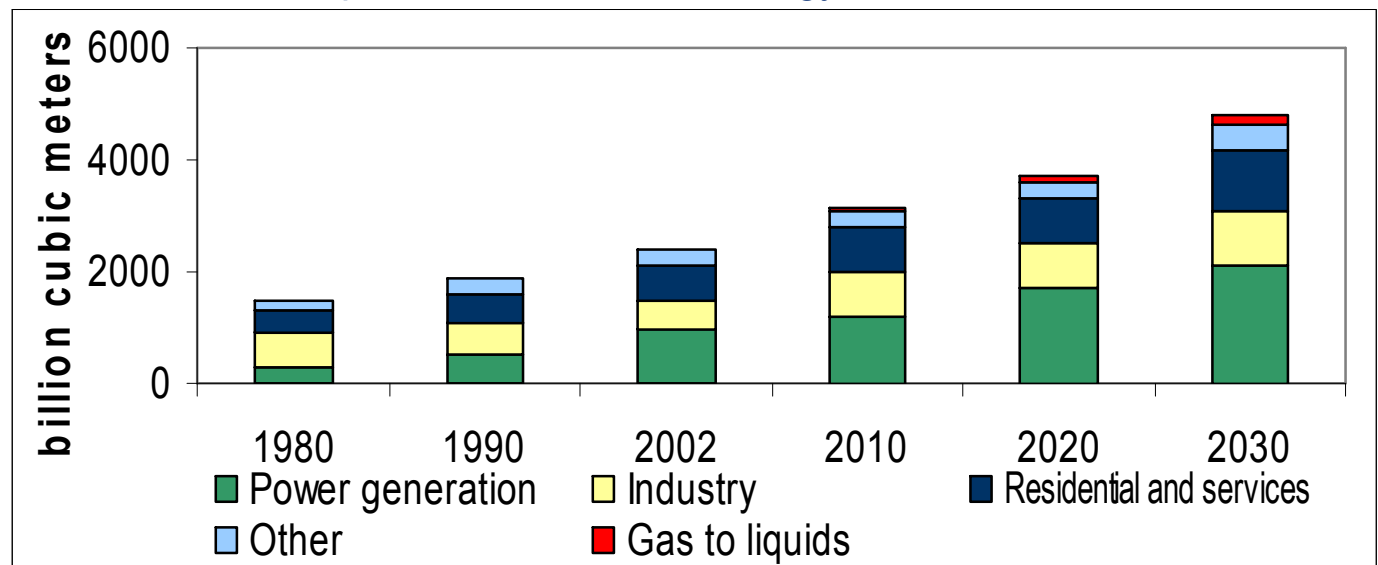


# Stranded gas uses have emerged

- Large volumes of gas are no longer economic to vent/flare at the production site, as they may have been during the site's startup
  - Increased demand while wellhead gas prices have risen 470% since 1980

## World Natural Gas Demand by Sector

Adapted from IEA World Energy Outlook 2004





# Market outlets for stranded gas

- Example 1: BP instituted '**reduced emission completions**' to market gas that would otherwise be vented during well completions. The operator uses portable equipment to process gas and send it to the sales pipeline, saving about 10 million cubic meters (mcm)/year on 106 wells.
- Example 2: Since 1993, Gas STAR transmission partners have installed lower emitting technologies, e.g., centrifugal **compressor dry seals** have saved 0.1 bcm.





# Market outlets for stranded gas

- Example 3: TNK-BP completed a **gas compressor station** in 2006 to market 200 mcm/year which was previously flared in the Zagorsk-Lebyazhinsk fields.
- Example 4: **Local power generation** can utilize gas and provide Emission Reduction Units. **Gas processing** expansions can bring associated gas up to pipeline quality.





# Recovering flared and vented gas

- 🔥 Natural Gas STAR partners approach the stranded gas problem by installing new equipment



- 🔥 **Reduced Emission Completions:**

capture gas and condensate during completion



- 🔥 **Vapor Recovery:**

capture gas vents from stock tanks



- 🔥 **Plunger Lift Smart Automation:**

capture gas vented for liquids unloading

Methane Savings:

- 🔥 Up to 0.3 mcm / completion

- 🔥 0.1 to 3 mcm / installation

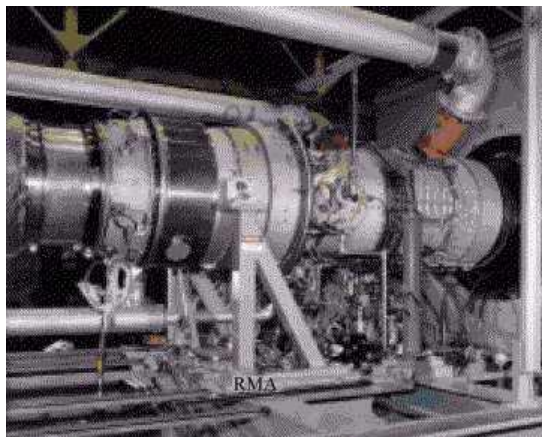
- 🔥 0.01 mcm / year / well



# Utilizing recovered gas

## For large gas volumes

- Install combustion gas turbine generator
- Eliminates power purchases
- Provides revenue source when selling power back to the grid
- Other options
  - Gas gathering pipelines, processing, compression



Rolls Royce-Avon combustion gas turbine

## For small gas volumes

- Install microturbine generator
- Eliminates power purchases
- Other options
  - Market gas locally with short pipeline
  - Generate steam / heat for local market / use



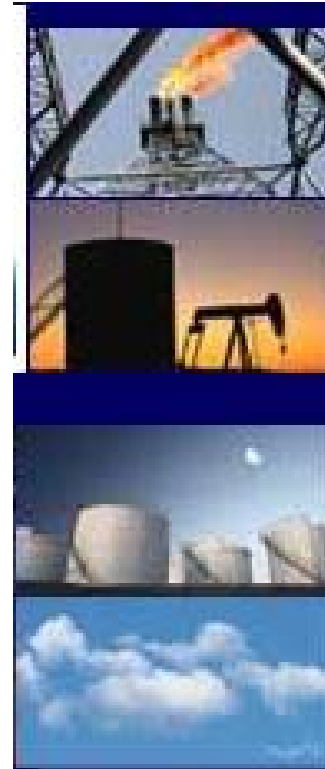
Ingersoll Rand 250 kW Microturbine



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- 🔥 Stranded and Un-utilized Gas
- 🔥 Uses for Stranded Gas
- 🔥 Bringing Stranded Gas to Market
- 🔥 **Addressing Barriers**





# Barriers to bringing stranded gas to market

## Why have these projects not been done?

- 💧 Greater investment opportunities elsewhere
  - 💧 Higher gas prices are attracting large infrastructure projects
  - 💧 Carbon markets may further enhance economic attractiveness
- 💧 Government regulation
  - 💧 United States Public Utility Commissions provide no economic incentive for reducing methane emissions
  - 💧 Imbalances in Russia's oil and gas production and lack of capacity cause excessive associated gas flaring
  - 💧 Governments through monopoly gas companies limit access to gas markets, forcing associated gas flaring
- 💧 Lack of technical knowledge that opportunities exist
- 💧 Lack of management buy-in

**Barriers are being overcome as companies publicize case studies (e.g., Gas STAR partners)**



# Contact Information

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